RESEARCH PAPER

Use of nicotine replacement therapy to reduce or delay smoking but not to quit: prevalence and association with subsequent cessation efforts

Douglas E Levy, Anne N Thorndike, Lois Biener, Nancy A Rigotti

Tobacco Control 2007;**16**:384–389. doi: 10.1136/tc.2007.021485

See end of article for authors' affiliations

Correspondence to: Douglas E Levy, PhD, Institute for Health Policy, Massachusetts General Hospital, 50 Staniford Street, 9th floor, Boston, MA 02114, USA; douglas_levy@hms2.harvard.edu

Received 22 April 2007
Accepted 6 July 2007

Objective: To assess the prevalence of nicotine replacement therapy (NRT) use for purposes other than quitting smoking and examine the relation of this non-standard NRT use (NSNRT) with subsequent smoking cessation efforts.
Design: A population based cohort study of adult smokers who were interviewed by telephone at baseline (2001–2) and at two year follow-up. The association between NSNRT use to cut down on smoking or to delay smoking before baseline and cessation attempts and smoking outcomes at two year follow-up was assessed using logistic regression to adjust for multiple potential confounding factors.
Setting: Massachusetts, USA.
Subjects: 1712 adult smokers in Massachusetts who were selected using a random digit dial telephone survey.
Main outcome measures: Quit attempt in 12 months before follow-up, NRT use at quit attempt in 12 months before follow-up, smoking cessation by follow-up, or 50% reduction in cigarettes smoked per day between baseline and follow-up.
Results: 18.7% of respondents reported ever having used NSNRT. In a multiple logistic regression analysis, there was no statistically significant association between past NSNRT use and quit attempts ($OR_{cut\ down}$ = 0.89, 95% CI 0.59 to 1.33; OR_{delay} = 1.29, 95% CI 0.73 to 2.29), smoking cessation ($OR_{cut\ down}$ = 0.74, 95% CI 0.43 to 1.24; OR_{delay} = 1.22, 95% CI 0.60 to 2.50) or 50% reduction in cigarettes smoked per day ($OR_{cut\ down}$ = 0.93, 95% CI 0.62 to 1.38; OR_{delay} = 0.80, 95% CI 0.43 to 1.49) at follow-up. Past use of NRT to cut down on cigarettes was associated with use of NRT at a follow-up quit attempt ($OR_{cut\ down}$ = 2.28, 95% CI 1.50 to 3.47) but past use of NRT to delay smoking was not (OR_{delay} = 1.25, 95% CI 0.67 to 2.34).
Conclusions: Use of NRT for reasons other than quitting smoking may be more common than was previously estimated. This population based survey finds no strong evidence that NRT use for purposes other than quitting smoking is either harmful or helpful.

Nicotine replacement therapy (NRT) for smoking cessation has been shown to be effective in clinical trials,[1] but evidence for its effectiveness at the population level has been difficult to demonstrate.[2 3] Nevertheless, it is a first line drug for treating tobacco dependence in the United States, the United Kingdom and other clinical guidelines.[4–7]

Concerns about the potential for misuse and abuse of or dependence on NRT have existed from its debut[8] and were the basis for its initial prescription only status in the United States,[9] but these concerns proved to be unfounded. Ultimately, NRT's prescription only status was viewed as an impediment to greater use among smokers attempting to quit.[8 10] The nicotine patch and gum became available over the counter (OTC) in the United States in 1996,[3] and nicotine lozenges entered the US OTC market directly in late 2002. Once these products were on the OTC market, there was a greater potential for them to be used for reasons other than temporarily to aid cessation, a practice known as off-label use.

Research investigating the off-label use of NRT focused initially on the persistent use of NRT in ways indicating addiction or abuse. It found that addiction to and abuse of current forms of NRT are uncommon.[11–13] Much less is known about the use of NRT for purposes other than smoking cessation, which we call "non-standard" NRT (NSNRT) use. Smokers who are not trying to quit could use NRT to reduce the number of cigarettes smoked per day or to delay smoking for a planned period of time, such as during work hours or on an aeroplane flight.

Using NRT for non-standard purposes might allow smokers to maintain a dependence on nicotine and continue their exposure to cigarette smoke at the same level. If so, NSNRT use would do little to decrease the harm done by cigarette smoking. Alternatively, NSNRT may facilitate a reduction in the number of cigarettes per day that an individual smokes and might ultimately encourage a smoker to attempt quitting. Several clinical trials suggest that NRT use among smokers who do not wish to quit or who are unable to quit but who are willing to attempt to cut down on smoking results in reductions in cigarettes smoked per day[14–16] and increased cessation rates,[14 16] though not all trials arrive at these conclusions.[17] To date, there are no studies evaluating smoking outcomes for NSNRT use as it occurs outside of clinical trials. The prevalence of NSNRT use in the population is unclear and whether this practice increases, decreases or does not affect the likelihood that smokers will subsequently quit smoking is also not clear.

In the present study we used a population based prospective survey of adult smokers in Massachusetts to determine the impact of past NSNRT use on quit attempts, quitting smoking, reducing number of cigarettes smoked per day and standard use of NRT for the purpose of quitting. Past NSNRT use was assessed at baseline in 2001–2. Two years later, respondents

Abbreviations: NRT, nicotine replacement therapy; NSNRT, non-standard nicotine replacement therapy; OTC, over the counter

were resurveyed to assess the incidence of quit attempts and smoking outcomes.

METHODS

Sample

Over the course of 18 months from January 2001 to June 2002 the Center for Survey Research at the University of Massachusetts, Boston, conducted a probability sample random digit dial survey of Massachusetts residents to study smoking practices, attitudes and support for tobacco control policies in the state. The survey oversampled smokers, young adults and recent quitters to ensure adequate power to study those subpopulations. Survey personnel successfully screened 66% of sampled households and interviewed 70% of selected adults for a final sample size at baseline of 6739.

Beginning in January 2003 and continuing through July 2004, all 3084 respondents who indicated they were smokers at baseline were recontacted. Of these, 1728 completed follow-up interviews (56.1%). We excluded 16 respondents whose smoking status responses were inconsistent between baseline and follow-up resulting in a follow-up dataset of 1712 respondents.

Baseline measures

NRT use was assessed at baseline by asking current smokers three questions. Two questions inquired about NSNRT use: ''Have you ever used the nicotine patch or nicotine gum *when you were not trying to quit* but wanted to *cut down* on the amount you smoke?'' and ''Have you ever used the nicotine patch or nicotine gum *when you were not trying to quit* but had to *delay* smoking for some reason, for example, during work or on an airplane?'' There were no questions asked about non-standard use of other nicotine replacement products. Nicotine lozenges were not on the US market at the time of the baseline survey. Nicotine inhalers and nasal spray were available but only with a prescription in the United States and less likely to be used in a non-standard fashion. The baseline survey did not determine the exact time in the past when NSNRT use had occurred. NSNRT use was not measured between baseline and follow-up and, therefore, our analyses included only the effects of any past NSNRT use. Standard NRT use was assessed by asking smokers about their most recent quit attempt: ''Did you use nicotine replacement to help you quit? (the patch, gum, nasal spray, or inhaler).''

Outcomes

We studied the relation between past NSNRT use at baseline and four smoking outcomes measured at two year follow-up: (1) an attempt to quit smoking in the year before follow-up (includes successful quitters); (2) use of NRT (the patch, gum, inhaler or nasal spray) at any quit attempt in the year before follow-up; (3) a 50% reduction in the number of cigarettes smoked per day; and (4) quitting smoking. Smoking reduction was measured as a binary variable for ease of interpretation. The variable was equal to one when the respondent quit smoking by follow-up or the number of cigarettes smoked per day at follow-up was no more than half the cigarettes smoked per day at baseline. The variable was coded zero otherwise. We tested the sensitivity of our findings to this characterisation by conducting alternative analyses where smoking reduction was defined as *any* reduction in the number of cigarettes smoked per day.

Analysis

We examined the prevalence of NRT use among the baseline population including all respondents who were current smokers at baseline (n = 3084). We also conducted bivariate χ^2 analyses to determine how the characteristics of smokers with a history of NSNRT use differ from those with no history of NSNRT use. All analyses were adjusted for the sampling weights in the survey design. NSNRT use was characterised as past NSNRT use *only* to cut down on smoking, past NSNRT use *only* to delay smoking, past NSNRT use both to cut down on smoking and to delay smoking and no history of NSNRT use.

Using logistic regression, each outcome was measured as a function of any past NSNRT use and a variety of control variables for respondents who were current smokers at baseline. Any past NSNRT use to cut down on smoking and any past NSNRT use to delay smoking were entered into the regression models as independent binary variables. We assumed that the effect of any past NSNRT to cut down on smoking was independent of the effect of any past NSNRT to delay smoking. Our regressions controlled for respondents' age, sex, race/ethnicity, marital status, education, income, region of the state, baseline smoking intensity (0–10 cigarettes per day, 11–20 cigarettes per day or ⩾21 cigarettes per day), smoking a cigarette within 30 minutes of waking, baseline intention to quit (within 30 days, within 6 months), receipt of smoking cessation assistance from a medical professional at most recent quit attempt and use of NRT at a quit attempt in the 12 months before baseline. All analyses were conducted using Intercooled Stata 9.2 for Windows (College Station, TX, USA).

RESULTS

Past non-standard and standard NRT use at baseline

Among the population of current smokers interviewed at baseline, 18.7% reported ever using NRT for non-standard purposes (table 1): 11.8% reported any past NSNRT use only to cut down on smoking, 2.4% reported any past NSNRT use only to delay smoking, and 4.5% reported some past NSNRT use both to cut down on and delay smoking. Most current smokers reporting past NSNRT use had not used NRT for standard purposes (quitting) within the 12 months before.

Table 1 History of non-standard nicotine replacement therapy (NSNRT) use among baseline current smokers (unweighted n = 3084)†

	Any past NSNRT only to cut down (n = 349)	Any past NSNRT only to delay (n = 77)	Any past NSNRT to cut down and delay (n = 137)	No past NSNRT (n = 2521)	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	Total % (95% CI)
Standard use of NRT in last 12 months	3.0 (2.4 to 3.9)	0.5 (0.3 to 0.8)	1.4 (0.9 to 2.2)	5.1 (4.2 to 6.2)	10.0 (8.8 to 11.5)
No standard use of NRT in last 12 months	8.8 (7.8 to 10.2)	1.9 (1.4 to 2.6)	3.1 (2.4 to 3.9)	76.2 (74.2 to 78.0)	90.0 (88.6 to 91.2)
Total	11.8 (10.4 to 13.4)	2.4 (1.9 to 3.1)	4.5 (3.6 to 5.6)	81.3 (79.4 to 82.9)	100.0

†Table entries are weighted percentages.

Table 2 Characteristics of baseline current smokers by type of past NSNRT usage (unweighted n = 3084)†

	Any past NSNRT only to cut down (n = 349)	Any past NSNRT only to delay (n = 77)	Any past NSNRT to cut down and delay (n = 137)	No past NSNRT (n = 2521)
Demographic characteristics				
Female*	47.2	45.6	45.1	54.6
Age***				
18–24	7.8	17.8	15.6	19.6
25–44	43.1	48.8	35.3	48.1
45–64	39.6	30.0	47.2	27.5
65+	9.4	3.4	1.8	4.9
Race/ethnicity*				
White	82.5	91.3	81.0	82.9
Black	4.8	0.3	3.1	4.0
Hispanic	6.3	7.9	2.1	7.5
Other	6.4	0.6	13.8	5.7
Marital status***				
Married/living with partner	61.7	64.6	51.0	48.8
Divorced/separated	16.8	6.5	14.1	14.9
Widowed	5.6	1.7	4.0	3.3
Never been married	16.0	27.2	30.8	33.0
Education				
Less than high school	11.4	7.4	6.4	10.2
High school	37.1	28.6	35.4	39.6
Some college	27.7	39.8	30.0	26.1
BA or higher	23.9	24.2	28.2	24.1
Income				
⩽$30 000	25.4	13.2	28.0	27.5
$30 001–50 000	28.0	26.0	19.0	25.6
$50 001–75 000	25.6	33.2	28.5	23.3
$75 000+	20.9	27.6	24.5	23.7
Smoking behaviour				
Cigarettes per day***				
<11	27.7	28.5	25.7	42.7
11–20	53.5	57.1	46.1	42.3
>20	18.8	14.4	28.2	15.0
1st cigarette <30 minutes after waking***	64.6	66.0	68.8	48.7
Plans to quit				
In next 6 months	33.4	33.3	33.6	31.4
In the next 30 days	32.9	36.9	29.3	29.5
Made a quit attempt in past year***	57.2	43.4	53.2	43.3
Received help from a medical professional at last quit attempt**	11.2	10.2	8.2	5.6

†Table entries are weighted percentages, column totals for certain characteristics may not sum to 100% because of rounding; *p<0.05, **p<0.01, ***p<0.001.

Population characteristics

The characteristics of baseline current smokers varied across categories of past NSNRT use (table 2). Respondents with a history of NSNRT use were more likely to be male ($p = 0.04$) and to be married ($p<0.001$). Significant differences in age ($p<0.001$) and race/ethnicity ($p = 0.02$) existed across categories of past NSNRT use, but not in any clear pattern. There were no significant differences in education or income according to past NSNRT use. Smokers who had ever used NSNRT had greater nicotine dependence as measured by smoking the first cigarette of the day within 30 minutes of waking ($p<0.001$) and by number of cigarettes smoked per day ($p<0.001$).[18] Those smokers with a history of using NSNRT to cut down on smoking (but not those who used it only to delay smoking) were more likely than others to have made a quit attempt in the year before baseline ($p<0.001$). Past NSNRT users were also more likely to have received help from a medical professional at their last quit attempt ($p = 0.001$) than those with no history of NSNRT use. There were no significant differences in intention to quit according to past NSNRT use.

Past NSNRT and smoking behaviour at follow-up

Bivariate analyses

In unadjusted comparisons, we found no significant difference in the likelihood of making a quit attempt during the two year follow-up according to past NSNRT use (table 3). Those with any history of NSNRT use were more likely to have used NRT at a quit attempt in the year leading up to the follow-up interview than those respondents who had no history of NSNRT use ($p<0.001$). Past NSNRT use was not found to be associated with either a higher or lower likelihood of quitting smoking or reducing smoking by 50% over the two year follow-up period.

Multivariate analyses

Table 4 presents the results of logistic regressions that estimate the relation between past NSNRT use and quitting behaviours and adjusted for potential confounders. We find no statistically significant relation between a history of NRT use, whether standard or non-standard, and attempting to quit smoking over the two year follow-up period. As expected, smoking fewer cigarettes per day, less nicotine dependence (as measured by time to first morning cigarette), expressed intention to quit in either the next 30 days or 6 months, a quit attempt in the year before baseline, and previous receipt of smoking cessation assistance from a medical professional at a past quit attempt were all predictive of a follow-up quit attempt. Heavier smokers were less likely to attempt cessation.

Although past NRT use of any kind is not associated with follow-up quit attempts, past NSNRT to cut down ($p<0.001$) and past use of NRT for smoking cessation ($p<0.001$) were both strongly associated with a higher odds of subsequent use of NRT for smoking cessation in the year before follow-up. As with cessation attempts, NRT use for smoking cessation during the year before follow-up was positively associated with receipt

Table 3 Unadjusted outcomes by past NSNRT use (unweighted n = 1563)†

	Any past NSNRT only to cut down (n = 207)	Any past NSNRT only to delay (n = 35)	Any past NSNRT to cut down and delay (n = 73)	No past NSNRT (n = 1248)
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Made follow-up quit attempt	57.9 (50.2 to 65.2)	71.2 (54.3 to 83.7)	54.3 (38.6 to 69.2)	54.2 (50.6 to 57.7)
Used NRT at follow-up quit attempt***	44.1 (36.5 to 52.0)	34.2 (19.6 to 52.7)	48.3 (33.8 to 63.2)	18.1 (15.6 to 20.8)
Reduced cigarettes/day ⩾50% by follow-up	33.8 (25.8 to 42.9)	32.2 (17.8 to 51.2)	19.6 (11.6 to 31.0)	31.6 (28.7 to 34.8)
Quit by follow-up	17.9 (11.4 to 27.0)	24.2 (12.1 to 42.6)	12.2 (6.2 to 22.5)	18.6 (16.1 to 21.4)

†Table entries are weighted percentages; *p<0.05, **p<0.01, ***p<0.001.

of smoking cessation assistance from a medical professional at a quit attempt before baseline and expressed intention to quit within 30 days or 6 months. Heavier smoking was also positively associated with NRT use at a quit attempt in the year before follow-up.

Over the two year follow-up period, we found no evidence that past NSNRT use was associated with either a 50% reduction in cigarettes smoked per day or the likelihood of smoking cessation. This was true even when we loosened the definition of a reduction in smoking to be *any* reduction in smoking (results not shown). The heaviest smokers were more likely to reduce the number of cigarettes per day they smoked between baseline and follow-up than were lighter smokers (p = 0.04). Those indicating smoking the first cigarette of the day within 30 minutes of waking were both less likely to reduce the number of cigarettes per day (p<0.001) and less likely to quit smoking (p = 0.001) by the time of the follow-up interview.

DISCUSSION

In the present study we report what is to our knowledge the first population based longitudinal study of the use of nicotine replacement products for reasons other than quitting smoking (non-standard NRT use, NSNRT). We found that just under one fifth of current smokers in Massachusetts reported past NSNRT use. Past NSNRT use was associated with greater nicotine dependence. We found no strong association between past NSNRT use and smoking outcomes in a two year follow-up period. Nor did we identify an association between a history of NSNRT use and subsequent quit attempts. However, we did find that past NSNRT use was associated with an increase in the likelihood that the respondents used NRT at a quit attempt during the follow-up period.

The total percentage of current smokers with a history of NSNRT use that we find in Massachusetts in 2001–2 (18.7%) is somewhat higher than what was found in an earlier survey of smokers in the state (13.7%)[3] and is much higher than findings reported elsewhere. A 2002 population based survey in California of current smokers found that 2.3% had ever used NRT to delay smoking and 1.3% had ever used NRT to cut down on cigarette consumption.[19] Unfortunately, the rates of past NSNRT use in our study and the California study are not perfectly comparable. Our survey asked specifically about NRT use for purposes other than quitting while the California study asked an open ended question about the purpose of past NRT use, which was then abstracted into categories in such a way that respondents could not indicate they had used NRT for both standard and non-standard purposes.

With evidence that more smokers are using NRT for non-standard purposes than previously suspected, it is essential that the consequences of NSNRT use be more fully understood. A direct implication of our findings is that population based surveys that seek to examine the effectiveness of NRTs should not assume that all smokers are using NRT for the purpose of quitting. Future studies of the effectiveness of NRT at the population level should include questions to clarify the purpose

Table 4 Logistic regression models: effect of previous NSNRT use on quit attempts and smoking behaviour

	Follow-up quit attempt	Used NRT at follow-up quit attempt	Reduced cigarettes smoked per day ⩾50%	Quit smoking
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Unweighted (n)	1229	1351	1340	1341
Any past NSNRT to cut down	0.89 (0.59 to 1.33)	2.28 (1.50 to 3.47)***	0.93 (0.62 to 1.38)	0.73 (0.43 to 1.24)
Any past NSNRT to delay smoking	1.29 (0.73 to 2.29)	1.25 (0.67 to 2.34)	0.80 (0.43 to 1.49)	1.22 (0.60 to 2.50)
Used NRT at quit attempt ⩽12 months before baseline	0.82 (0.46 to 1.44)	5.85 (3.46 to 9.89)***	1.16 (0.72 to 1.88)	1.27 (0.73 to 2.20)
Nicotine dependence				
Cigarettes per day				
<11	1.00	1.00	1.00	1.00
11–20	0.59 (0.41 to 0.85)**	2.07 (1.38 to 3.12)***	0.92 (0.66 to 1.27)	0.74 (0.51 to 1.09)
>20	0.57 (0.35 to 0.94)*	2.03 (1.15 to 3.56)*	1.61 (1.01 to 2.55)*	0.59 (0.33 to 1.06)
1st cigarette <30 minutes after waking	0.74 (0.53 to 1.04)	1.35 (0.92 to 1.98)	0.52 (0.38 to 0.71)***	0.55 (0.38 to 0.79)***
Plans to quit				
In next 6 months	3.72 (2.51 to 5.51)***	2.91 (1.86 to 4.56)***	1.11 (0.76 to 1.62)	1.41 (0.91 to 2.17)
In the next 30 days	2.67 (1.91 to 3.73)***	1.75 (1.15 to 2.69)**	0.85 (0.60 to 1.21)	1.04 (0.68 to 1.59)
Made a quit attempt in year before baseline	2.74 (1.98 to 3.80)***	1.30 (0.89 to 1.90)	1.21 (0.89 to 1.65)	0.87 (0.60 to 1.27)
Received help from a medical professional at last quit attempt before baseline	3.47 (2.00 to 6.03)***	3.04 (1.91 to 4.84)***	1.33 (0.87 to 2.02)	1.24 (0.72 to 2.13)

*p<0.05, **p<0.01, ***p<0.001. Models also control for age, sex, race/ethnicity, marital status, education, income and region of the state.

What this paper adds

- In the United States, nicotine replacement therapy (NRT), which is sold without prescription, is approved as a temporary aid to smoking cessation. However, smokers could purchase NRT to delay or reduce smoking rather than to quit (non-standard NRT use, NSNRT). The prevalence of NSNRT use and its effect on subsequent smoking cessation effort are unclear.
- In this cohort study, previous NSNRT use was reported by 18.7% of a population based sample of adult smokers in Massachusetts, USA. Past NSNRT use was associated with no large increase or decrease in quit attempts, reduction in cigarettes smoked per day, or smoking cessation at two year follow-up. This study indicates that NSNRT use is not uncommon, but does not appear to cause harm by discouraging subsequent cessation efforts.

of NRT use. Furthermore, NRT is increasingly being recommended for the purpose of cutting down on cigarette consumption, even when quitting is not the immediate goal. Since 1997, 10 European countries have expanded the approved indications for NRT to include the goal of smoking reduction.[20] The UK's National Institute for Health and Clinical Excellence (NICE) recently concluded that the balance of the evidence indicates that use of nicotine gum or inhalers to cut down on smoking improves cessation rates.[21] As a result, the UK label for NRT was expanded in 2006 to permit the use of NRT to reduce cigarettes smoked per day in preparation for quitting.[20] Public health officials and advocates in the United Kingdom have now embraced the notion of ''reduce to quit.''[20–22] To date, the evidence in support of using NRT as a means to cut down smoking with the secondary effect of smoking cessation has been limited to clinical trials. Our findings begin to shed light on the effect of NSNRT on smoking outside the clinical trial context. Because we were unable to observe the timing of NSNRT use in our study, we cannot directly compare our results with those in the clinical trials that have been conducted. Though not statistically significant, the associations between past use of NSNRT to cut down with quit attempts and smoking cessation at follow-up are negative while the associations between past use of NSNRT to delay smoking with quit attempts and smoking cessation at follow-up are positive. These effects are the opposite of what one would expect assuming cutting down is indicative of an intention to quit and delaying smoking is indicative of a lack of intention to quit. However, these effects have very wide confidence intervals and we find no strong evidence to indicate that past NSNRT use is harmful. Our results do not indicate that past NSNRT use leads to fewer quit attempts or lower quit rates.

Our findings should be considered in the context of several limitations. Firstly, our survey was designed to assess a wide range of tobacco related issues, but not NSNRT specifically. We did not ascertain the specific timing of NSNRT usage, nor do we have information on the specific type (gum or patch) or quantity of NRT used for the NSNRT. If respondents who bought NRT initially for the purpose of quitting but who were ultimately unsuccessful at smoking cessation later indicated that their NRT use had been for the purpose of cutting down or delaying smoking rather than for quitting, we have overstated our estimate of past NSNRT use, though we have nothing to indicate that that was the case. Because we do not have narrow confidence intervals for our regression estimates, we are only able to rule out large effect sizes. If there are variables that we have not measured that are associated with both NSNRT use and our outcomes, our findings may suffer from confounding. The survey is representative of Massachusetts smokers; to the extent that the population and environment of Massachusetts are different from other geographic areas, our findings may not be generalisable. Finally, we were only able to reach 56% of the respondents who indicated they were current smokers at baseline for our follow-up survey. However, this is comparable to other longitudinal surveys of tobacco use.[23] Our analysis included all observable variables that were found to be associated with loss to follow-up. Provided that our outcomes are missing at random conditional on these observed covariates, our findings should not suffer bias because of missing data.

Conclusion

Our population based survey finds that NSNRT use may be more common among smokers than was previously estimated. Future surveys of NRT use should explicitly distinguish between standard and non-standard uses of NRT. There is no evidence that smokers using NRT for non-standard purposes are more or less likely to subsequently quit smoking or to reduce the number of cigarettes smoked per day. Indications for NRT use are broadening to include its use in smokers who are not stopping smoking immediately, and some experts advocate NRT use to reduce harm even in smokers who do not intend to quit smoking at all. It is essential that we fully understand the population impact of these policy changes. This population based survey finds no strong evidence that NRT use for purposes other than quitting smoking is either harmful or helpful.

Authors' affiliations

Douglas E Levy, Nancy A Rigotti, Institute for Health Policy, Massachusetts General Hospital, Boston, MA, USA
Douglas E Levy, Anne N Thorndike, Nancy A Rigotti, Tobacco Research and Treatment Center, Massachusetts General Hospital, and Harvard Medical School, Boston, MA, USA
Lois Biener, Center for Survey Research, University of Massachusetts-Boston, Boston, MA, USA

Funding: This research was supported by US National Institutes of Health grants NCI R01-CA86257 and NHLBI K24-HL04440.

Competing interests: NAR has received research grants from Pfizer, Sanofi-Aventis, Nabi Biopharmaceuticals, and Glaxo Smith Kline. She has consulted for Pfizer and Sanofi-Aventis. The other authors report no competing interests.

REFERENCES

1 **Silagy C**, Lancaster T, Stead L, *et al*. Nicotine replacement therapy for smoking cessation. *The Cochrane Library* 2001;(3).
2 **Pierce JP**, Gilpin EA. Impact of over-the-counter sales on effectiveness of pharmaceutical aids for smoking cessation. *JAMA* 2002;**288**:1260–4.
3 **Thorndike AN**, Biener L, Rigotti NA. Effect on smoking cessation of switching nicotine replacement therapy to over-the-counter status. *Am J Public Health* 2002;**92**:437–42.
4 **Fiore MC**, Bailey WC, Cohen SJ, *et al. Treating tobacco use and dependence. A clinical practice guideline.* Rockville, MD: United States Department of Health and Human Services, Public Health Service, 2000.
5 Report of the Committee on Safety of Medicines Working Group on Nicotine Replacement Therapy: Medicines and Healthcare products Regulatory Agency: Committee on Safety of Medicines 2005.
6 **West R**, McNeill A, Raw M. Smoking cessation guidelines for health professionals: an update. Health Education Authority. *Thorax* 2000;**55**:987–99.
7 **USDHHS**. *Reducing tobacco use: a report of the Surgeon General.* Rockville, MD: Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, US Department of Health and Human Services., 2000.
8 **Shiffman S**, Gitchell J, Pinney JM, *et al*. Public health benefit of over-the-counter nicotine medications. *Tob Control* 1997;**6**:306–10.
9 **Henningfield JE**, Keenan RM. Nicotine delivery kinetics and abuse liability. *J Consult Clin Psychol* 1993;**61**:743–50.
10 **Hughes JR**, Goldstein MG, Hurt RD, *et al*. Recent advances in the pharmacotherapy of smoking. *JAMA* 1999;**281**:72–6.

11 **Shiffman S**, Hughes JR, Di Marino ME, *et al*. Patterns of over-the-counter nicotine gum use: persistent use and concurrent smoking. *Addiction* 2003;**98**:1747–53.
12 **Hughes JR**, Adams EH, Franzon MA, *et al*. A prospective study of off-label use of, abuse of, and dependence on nicotine inhaler. *Tob Control* 2005;**14**:49–54.
13 **Shiffman S**, Hughes JR, Pillitteri JL, *et al*. Persistent use of nicotine replacement therapy: an analysis of actual purchase patterns in a population based sample. *Tob Control* 2003;**12**:310–6.
14 **Batra A**, Klingler K, Landfeldt B, *et al*. Smoking reduction treatment with 4-mg nicotine gum: a double-blind, randomized, placebo-controlled study. *Clin Pharmacol Ther* 2005;**78**:689–96.
15 **Bolliger CT**, Zellweger JP, Danielsson T, *et al*. Smoking reduction with oral nicotine inhalers: double blind, randomised clinical trial of efficacy and safety. *BMJ* 2000;**321**:329–33.
16 **Wennike P**, Danielsson T, Landfeldt B, *et al*. Smoking reduction promotes smoking cessation: results from a double blind, randomized, placebo-controlled trial of nicotine gum with 2-year follow-up. *Addiction* 2003;**98**:1395–402.
17 **Etter JF**, Laszlo E, Zellweger JP, *et al*. Nicotine replacement to reduce cigarette consumption in smokers who are unwilling to quit: a randomized trial. *J Clin Psychopharmacol* 2002;**22**:487–95.
18 **Heatherton TF**, Kozlowski LT, Frecker RC, *et al*. Measuring the heaviness of smoking: using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *Br J Addict* 1989;**84**:791–9.
19 **Al-Delaimy W**, Gilpin E, Pierce J. When California smokers use nicotine replacement therapy, most are trying to quit smoking. *Tob Control* 2005;**14**:359–360.
20 **MHRA**. *Report of the Committee on Safety of Medicines working group on nicotine replacement therapy*, Committee on Safety of Medicines, United Kingdom Medicines and Healthcare products Regulatory Agency, 2005.
21 **National Institute for Health and Clinical Excellence**. *Cut down to quit with nicotine replacement therapies (NRT) in smoking cessation: systematic review of effectiveness and economic analysis*. London: National Institute for Health and Clinical Excellence, 2007.
22 **ASH**. *Nicotine replacement therapy: guidance for health professionals on changes in the licensing arrangements for nicotine replacement therapy*. London: Action on Smoking and Health, 2005.
23 **Currivan D**, Carley-Baxter L. *Nonresponse bias in a longitudinal follow-up to a random-digit dial survey*, Method of Longitudinal Surveys Conference.University of Essex, Colchester, England, 2006.

ELECTRONIC PAGES

Tobacco Control Online: http://tc.bmj.com

The following electronic only article is published in conjunction with this issue of Tobacco Control.

Smoking cessation attempts among adolescent smokers: a systematic review of prevalence studies

Christina Bancej, Jennifer O'Loughlin, Robert W Platt, Gilles Paradis, André Gervais

Objective: To synthesise estimates of the prevalence of cessation attempts among adolescent smokers generally, and according to age and level of cigarette consumption.
Data sources: PubMed, ERIC, and PsychInfo databases and Internet searches of central data collection agencies.
Study selection: National population-based studies published in English between 1990 and 2005 reporting the prevalence, frequency and/or duration of cessation attempts among smokers aged ⩾10 to <20 years.
Data extraction: Five reviewers determined inclusion criteria for full-text reports. One reviewer extracted data on the design, population characteristics and results from the reports.
Data synthesis: In total, 52 studies conformed to the inclusion criteria. The marked heterogeneity that characterised the study populations and survey questions precluded a meta-analysis. Among adolescent current smokers, the median 6-month, 12-month and lifetime cessation attempt prevalence was 58% (range: 22–73%), 68% (range 43–92%) and 71% (range 28–84%), respectively. More than half had made multiple attempts. Among smokers who had attempted cessation, the median prevalence of relapse was 34, 56, 89 and 92% within 1 week, 1 month, 6 months, and 1 year, respectively, following the longest attempt. Younger (age<16 years) and non-daily smokers experienced a similar or higher prevalence of cessation attempts compared with older (age ⩾16 years) or daily smokers. Moreover, the prevalence of relapse by 6 months following the longest cessation attempt was similar across age and smoking frequency.
Conclusions: The high prevalence of cessation attempts and relapse among adolescent smokers extends to young adolescents and non-daily smokers. Cessation surveillance, research and program development should be more inclusive of these subgroups.
(*Tobacco Control* 2007;**16**:e8) http://tc.bmj.com/cgi/reprint/16/6/e8